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Paul J.J. Welfens

Significant Market Power in Telecommunications: Theoretical and Practical Aspects

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EUROPÄISCHES INSTITUT FÜR INTERNATIONALE WIRTSCHAFTSBEZIEHUNGEN (EIIW)/ EUROPEAN INSTITUTE FOR INTERNATIONAL ECONOMIC RELATIONS
Bergische Universität Wuppertal, Campus Freudenberg, Rainer-Gruenter-Straße 21,
D-42119 Wuppertal, Germany
Tel.: (0)202 – 439 13 71
Fax: (0)202 – 439 13 77
E-mail: welfens@uni-wuppertal.de
www.euroeiiw.de

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Summary: From an economic perspective efficiency and innovation are crucial aspects of functional competition in telecommunications where one has to take into account sector specific problems. Besides those specific aspects we consider the topic of significant market power and its evolution. As a special problem we focus on product bundling issues and aspects of network dynamics. As regards policy conclusions there is need for differentiated approaches. We emphasize the need for a dynamic perspective of competition in telecommunications markets. With respect to oligopolistic markets we present as a theoretically new approach an application of the Hitch-Sweezy model of competition – the implication is that (price)regulation should be restricted to a very small field.

Zusammenfassung: Effizienz und Innovation sind aus wirtschaftlicher Sicht wesentliche Aspekte funktionsfähigen Wettbewerbs in der Telekommunikation, wobei es eine Reihe sektorspezifischer Besonderheiten zu beachten gilt. Neben diesen Besonderheiten werden die grundlegenden Probleme der Herausbildung von Marktmacht bzw. der Verhinderung von signifikanter Marktmacht thematisiert. Dabei werden insbesondere auch Fragen der Produktbündelung und der Netzwerkdynamik in die Analyse einbezogen. Die Schlussfolgerung aus wirtschaftspolitischer Sicht wird jeweils in differenzierter Weise dargelegt. Eine dynamische Konzeption des Wettbewerbs ist für Telekommunikationsmärkte wesentlich, aus einer hier erstmals vorgetragenen Hitch-Sweezy-Modellierung des Wettbewerbs auf oligopolistischen Telekommunikationsmärkten ergibt sich die Konsequenz, dass die (Preis-)Regulierungspolitik erheblich zu reduzieren ist.

Prof. Dr. Paul J.J. Welfens, President of the European Institute for International Economic Relations at the University of Wuppertal, chair in Macroeconomics and Jean Monnet, Chair in European Economic Integration.

Gauss-Str. 20, D 42019 Wuppertal, +49 202 4393171

welfens@uni-wuppertal.de

www.euroeiiw.de

Significant Market Power in Telecommunications: Theoretical and Practical Aspects

1. Introduction: Efficiency Gains and Innovations in Competitive Markets

Telecommunications markets throughout the world economy are characterized by high economic and technological dynamics. The latter is partly related to digitization which blurs formerly existing market demarcation between e.g., cable TV, fixed-line telecommunications and broadcasting. Modern digital technologies have created larger markets in which data, voice, video and audio are transmitted via digital compressed signals.

Economic dynamics have been fostered by the liberalization date 1998 in fixed-line telecommunications; in mobile telecommunications by GSM technology and the roll-out of UMTS mobile technology which has begun in 2004/05. Moreover, in OECD countries there has been growing production and use of information and communication technology (ICT) has contributed to higher economic growth (AUDRETSCH/WELFENS, 2002); in addition to these developments the expansion of the Internet has also reinforced international trade and growth in many countries (WELFENS, 2003; BARFIELD/HEIDUK/WELFENS, 2003). The telecommunications sector is a crucial pillar of ICT; sustained competition in telecommunications could be quite important for mobilizing crucial productivity and welfare effects in the digital economy.

For historical reasons, the situation in fixed line telecommunications is peculiar; in most EU countries the former state-owned monopoly operator is a dominant firm and subject to asymmetric regulation in the fields of interconnection and access (read: local loop). Universal services are still an important element of fixed line telecommunications; broad and cheap access to telecommunications is an important ingredient of a social market economy. Due to modern mobile telecommunication technologies – such as GSM – there are new and mobile elements which could be included in a modern concept of telecommunications and digital universal services, respectively.

Mobile telecommunications plays an important role not only in Western Europe, North America and Asia, but is also crucial in transition countries in Eastern Europe (WELFENS/YARROW, 1997; WELFENS/YARROW, GRINBERG, GRAACK, 1999), and in many newly industrializing countries. EU eastern enlargement has created many challenges for regulatory reform, restructuring and privatization in EU accession countries. From the perspective of the overall EU, eastern enlargement stands for a considerable increase in EU market size (SOLBES, 2004).

The technological traits of mobile telephony are somewhat different from fixed-line networks; with respect to relatively poor countries one may emphasize that standard mobile services – e.g., based on GSM – can be rolled out rather quickly. Mobile telecommunications has its own regulatory problems where roaming and interconnection are two interesting elements. Termination fees are regulated in many countries.

According to EU framework regulation, for telecommunications achieving sustained competition in the telecommunications market is a crucial challenge for policymakers in EU member countries. Governments in these countries have chosen different approaches to support functional long-term competition. Main arguments in favour of supporting competition are as follows:

- competition is a means to enhance efficiency and force firms to bring prices down to costs (static efficiency) - plus a normal rate of return;

- competition is stimulating innovations, namely product innovations which offer more valuable products to customers – or process innovation which imply cost-cutting so that more users can afford the respective product or service (dynamic efficiency);
- competition offers conditions under which newcomers from other sectors or newly created companies can enter the market so that competition is a prerequisite for economic freedom;
- competition allows import competition and thus, contributes to an international division of labor;
- competition in sector I should not distort competition in sector J (and vice versa).

Competition laws in most countries against anti-competitive agreements concern

- anti-competitive agreements between firms: for example, bid rigging, price fixing, market divisions – agreements among firms not to compete in each other markets – and group boycotts (refusing to do business with specific supplier, competitor, customer)
- restricting or prohibiting mergers & acquisitions which could have – considerable – negative impact on competition
- problem of dominant position = significant market power; existence of significant market power is the major reason for regulation: abuse of dominant position is to be avoided.

Enforcing sustained competition in telecommunications will bring benefits in three ways:

- direct benefits for consumers which enjoy low prices and innovative services;
- lower production costs for all those firms which use the product/service as in input – in the case of telecommunication services the latter aspect is enormously important since almost every firm uses telecommunications services;
- growth of regionally or globally competitive firms which is the starting point to developing owner-specific advantages; those in turn are the basis for successful production abroad so that successful multinational investment abroad requires a competitive home market (domestic monopoly power is also useful for multinationalization in the sense that a monopoly generates high profits which can be used to easily finance production abroad, however, in technologically dynamic markets the more important aspect is ownership specific advantages which emerge in a competitive domestic home market).

The problem in fixed-line telecommunications is that the competition process in many countries is potentially distorted by abuse of market power of the dominant incumbent (often having 60-90 percent market share in local access); and international mergers might create even larger dominant firms which stand for both economic and political power. Establishing a regulatory authority for the telecommunications sector is useful because the specific traits in this sector hardly allow general competition law to be applied; for example, competition law deals with abuse of dominant market power in an ex post fashion while functional competition in telecommunications requires in many countries, considerable ex ante regulations. Arguing in favour of establishing and running a regulatory authority does not mean to overlook costs of regulation.

Clear, consistent and rather stable regulation for public telecommunications is crucial not only to bring about the benefits of competition for households and commercial users, such

regulation is also quite important for investors in the telecommunications sector. Rather stable regulations mean that regulatory rules should be adjusted over time, but sudden changes will hardly be adequate. There are two basic alternatives for regulatory authorities:

- emphasizing competition in telecommunications services which require more or less would aim at splitting fixed-line network operation from digital services and providing an incentive for the network operator(s) to generate in an efficient way as much value-added digital services as possible. Such an approach could be quite successful in fully exploiting existing network capacities, but it is unclear whether there would be sufficient incentives for network expansion over time;
- emphasizing infrastructure competition ("facilities-based competition") and hence, encouraging investment of the incumbent and of newcomers in infrastructure; at the same time vertical integration would be allowed so that network providers can operate the respective network and provide a range of services. A major problem could be the existence of major economies of scale (and economies of density) in network operation which imply natural monopoly problems in the sense that only one or a few firms will survive in the market. With only one major operator left there is the risk that the dominant company will be a rather weak innovator. If such dynamic inefficiencies are likely to be higher than the benefits of static exploitation of scale economies it is obvious that government should restrict mergers and acquisitions or impose that the dominant incumbent would have to sell part of its network.

The telecommunications sector is also a special sector because the concept of universal services requires that government makes sure that all people have access to telecommunications and that certain public interests be taken into account by network operators/service providers, e.g., life-line services.

Mobile telecommunications has become very popular in most countries. From a regulatory point of view it is necessary to allocate a scarce resource, namely frequencies. This can be done in various ways, for example, through a lottery, in a "beauty contest" (taking a closer look at the commercial and technological ability of competitors) or via an auction. From an economic perspective, auctioning off licenses is the best way to allocate frequencies. A major problem occurs if within the relevant market different modes of allocating frequencies are applied – from the perspective of the EU mobile market there is no level playing field if for example, Telefonica obtains practically for free, a national UMTS frequency for its mobile subsidiary while Deutsche Telekom has to pay a high price in the German auction for the national UMTS license.

In the following analysis a closer look is taken at the problem of market power where we look at some standard problems but also include aspects of network effects, vertical integration and technological progress. A new argument against vertical disintegration in telecommunications is presented. We also present a new view why there could be functional competition in oligopolistic markets; and argue that new dynamic limit-pricing models could be quite useful to analyze telecommunications markets. Finally, policy conclusions are presented.

2. Market Power

2.1. Market Power as a Theoretical Concept

In fixed-line telecommunications one must clearly distinguish the access markets and long distance/international telecommunications markets. Access to households or firms – to the user of telecommunications services – is vital for all services to be provided. In the case of an incumbent firm having a very high market share in the access market the regulator will have to make sure that other network operators obtain interconnection at non-discriminatory and cost-oriented prices.

Market power is an economic concept which has two key elements:

- the relevant market and product/service, respectively: market power of a firm concerns the special influence of this firm on the price of a specific product or service;
- the issue of sustainability of market power: a dominant market position which could easily come under attack by newcomers is obviously less of a problem for the regulator than a sustained dominant position in the market.

How can one measure market power? The most obvious way is to take into account the market share. The EU considers a market share of more than 50 percent as a strong indication of significant market power. However, market share could be somewhat below 50 percent, but there still could be a serious problem of market power; for example, the firm considered might have not only a strong market position but also have enormous financial clout so that it could embark upon aggressive, predatory pricing as a means to drive out competitors from the market.

Within a simplified approach one may distinguish between three different intensities of competition:

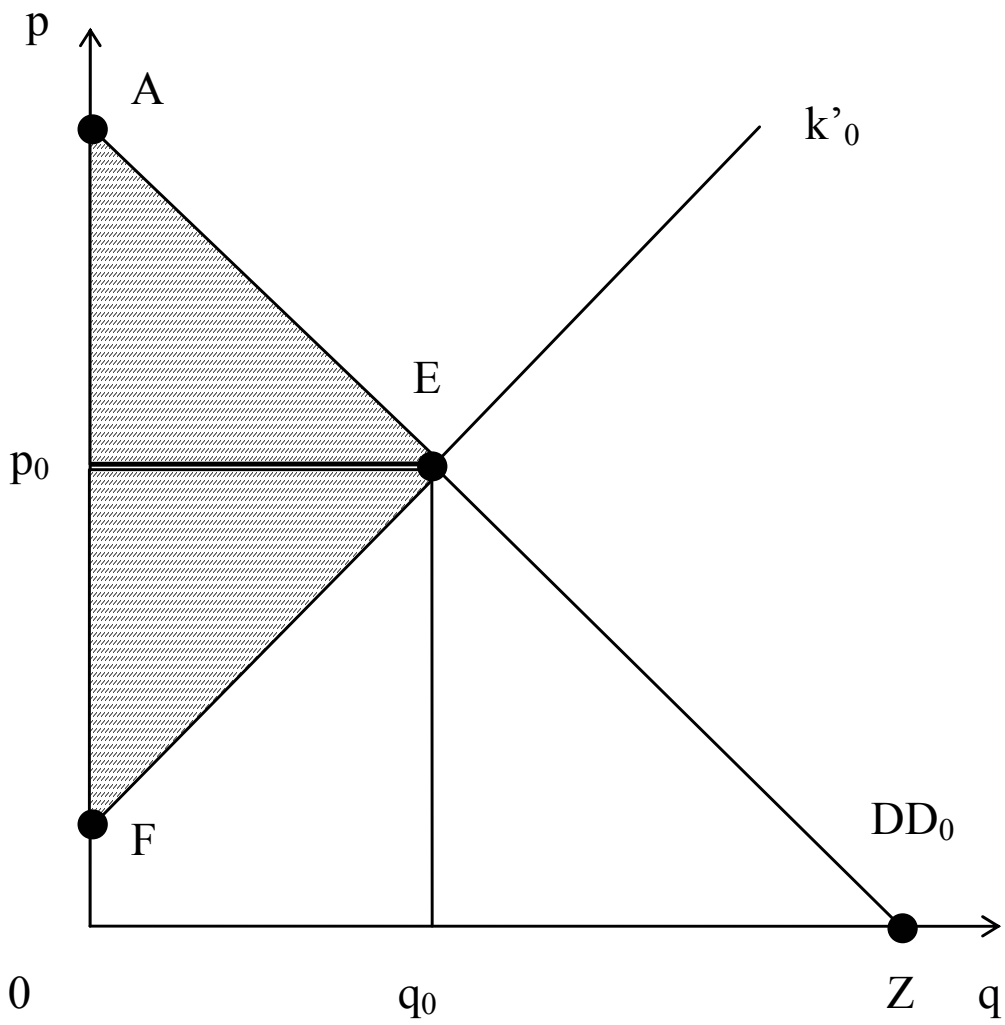
- (a) polypolistic competition where many firms face many users;
- (b) oligopolistic competition where a few firms face many users – depending on the strategies chosen by the respective firms there could be different equilibrium solutions in the market;
- (c) monopoly which means that only one firm faces many users (another special case would be the duopoly case where two firms compete against each other).

Economist take as a point of reference, often a simple but useful approach when it comes to analyzing the benefits of competition: The size of consumer surplus and of producer surplus are an indicator of economic welfare so that intensity of competition and regulatory interference, respectively, can be judged on this basis. Let us first, take the case of rising marginal costs k'; here it is important to note that profit-maximizing firms plan the quantity of goods to be produced (or services to be provided) on the basis of the marginal cost curve – the latter is identical to the supply curve. Marginal costs k' indicate the additional costs of one extra output unit. The integral over the marginal costs curve – that is the area under the k' curve (this includes a normal yield on capital input) – indicates the costs of production. Under competition all firms are price-takers in the market, the intersection of the sectoral supply curve SS_0 and the demand curve DD_0 determines market equilibrium. There is a market-clearing price p_0 at which all users can buy. Denoting equilibrium output as q_0 the revenue – this is equal to value-added if there are no inputs from other sectors in the respective

production – is p_0q_0. Costs are equal to the area $OFEq_0$ (read point q_0) which implies that residual profits are equal to the triangle p_0EF.

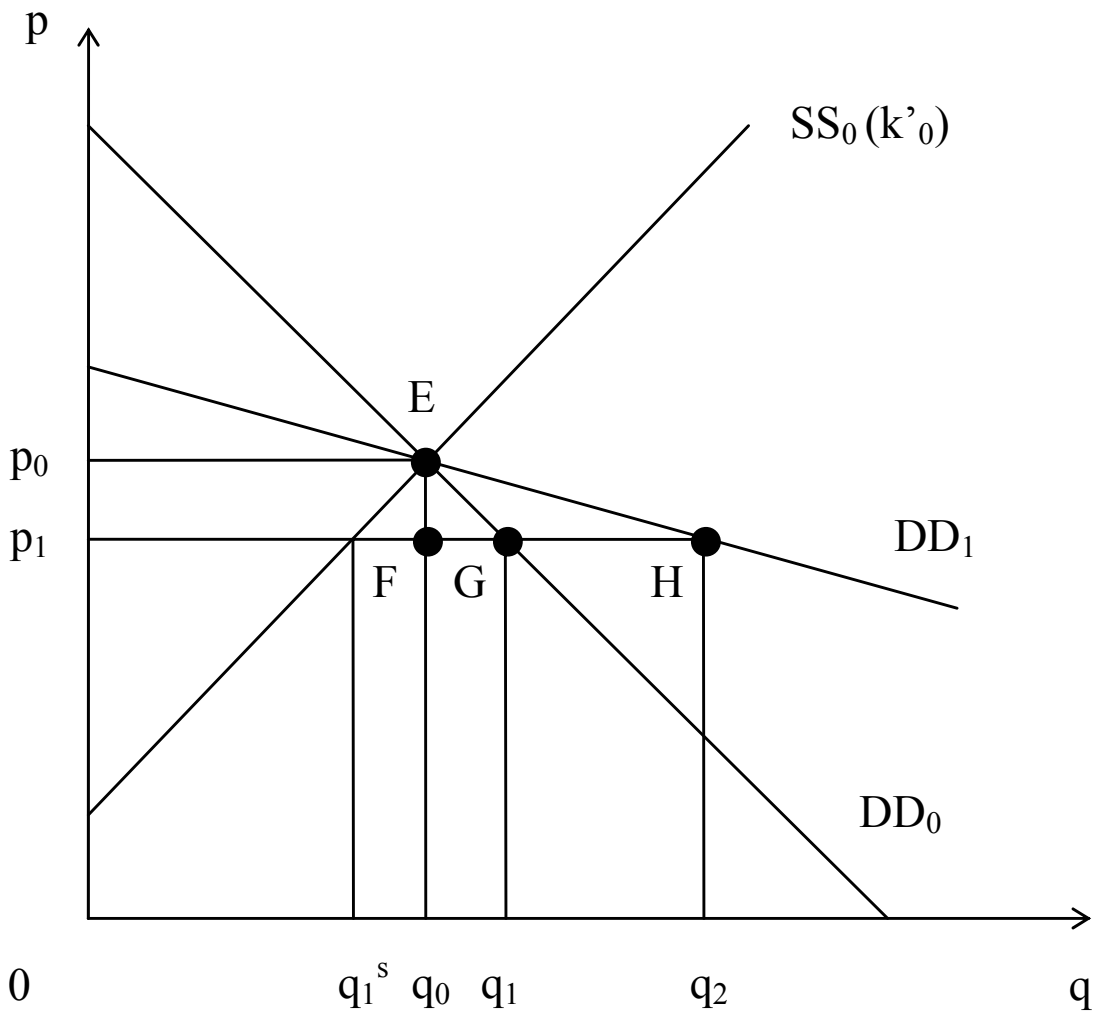
All users buy at the uniform market-clearing price p_0, however, many would have been willing to pay more, as is obvious from the arch AE on the demand curve: Hence, the triangle AEp_0 is an extra bonus for the users, this is "consumer surplus." In polypolistic competition all firms are price-takers. Each firm accepts the market-clearing price and then decides – based on the respective cost curve – how much it will produce (hence, the market supply curve consists of many bits and pieces of a supply curve where each bit and piece represent one of the firms; the cost curve starts with the firm which has the lowest marginal costs of production). The opposite of polypolistic competition is a monopoly in which the firm – the only firm in the market – is clearly aware that the market price is not given but price will influence demand. Profit-maximization in a monopoly leads to the well-known condition that marginal costs k'=marginal revenue R' (defined as the extra revenue from selling an additional unit: revenue is pq so that R'=dR/dq is p if price is given as in the case of polypolistic competition when the intersection of the supply curve and the demand curve determines market equilibrium; but dR/dq under monopoly is dp/dq q + p; and dp/dq is, of course, negative as the price falls if quantity is increased). Under monopoly the market price is always higher than in polypolistic competition and in this, quantity is lower.

Fig. 1: Consumer Surplus and Producer Surplus



An important aspect of market dynamics is the elasticity of demand which can be defined on a given demand curve ("point elasticity") or can be defined with respect to the slope of the demand curve: The higher the price elasticity of demand, the larger the number of customers that will defect once the price is raised; and the larger the increase in demand once the price is lowered. We can clearly see that the relatively elastic demand curve DD_1 will bring about a relatively larger increase in demand than the case of DD_0. The flatter the curve the easier consumers can substitute to another alternative – say, replace ISDN access through cable TV access or satellite access and so on.

Fig. 2: Elasticity of Demand and Market Equilibrium

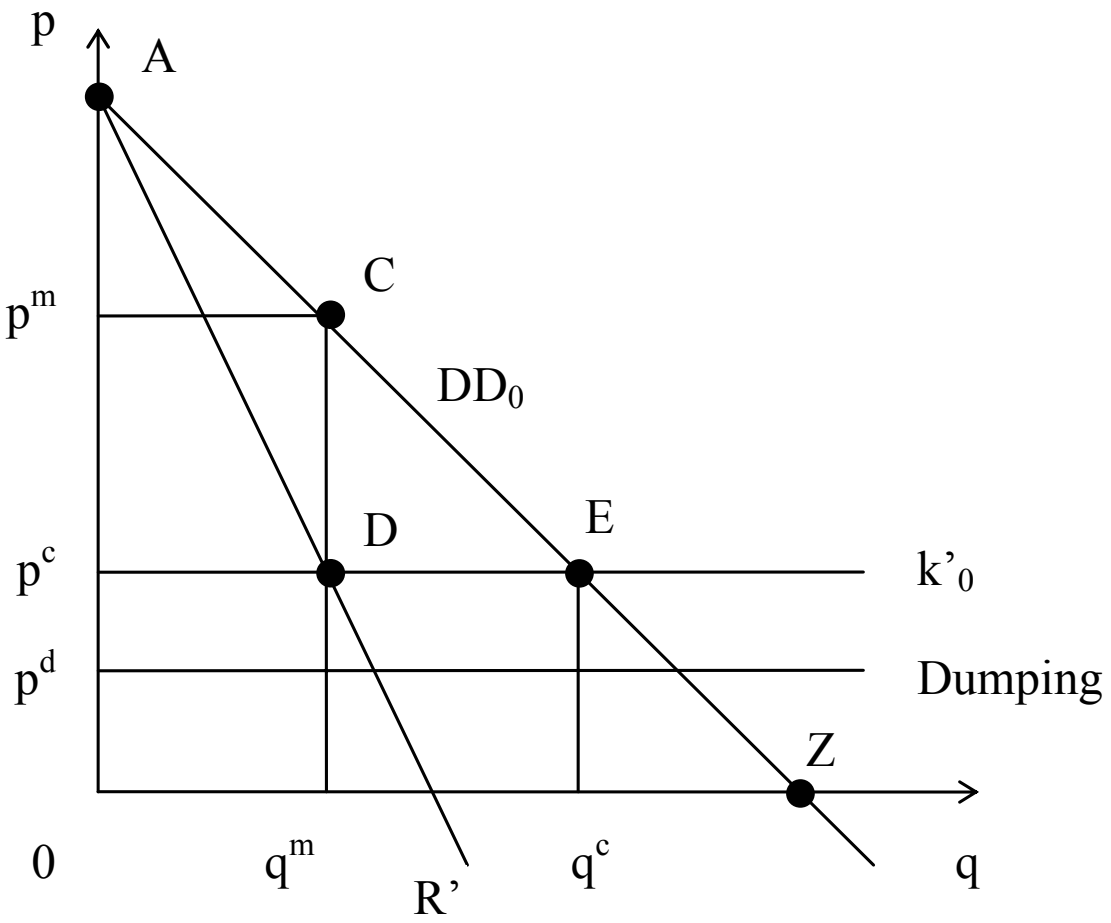


2.1.1. Market Share and Size of the Firm

Market power is largely associated with the ability to raise the price above marginal (or average) costs. A simple illustrative case is a monopoly in a situation with constant marginal costs. A profit maximizing monopoly will choose to produce according to the rule marginal costs equals marginal revenue so that point C on the demand curve is realized: Monopoly price is p^m, output is q^m. By contrast, under competition (intersection of marginal costs curve and demand curve determines equilibrium) we have a much lower price p^c and a much larger output q^c. Under competition consumer surplus is equal to the triangle AEp^c, but in a

monopoly it is only **AC**p^m; there is a permanent loss in consumer surplus which is equal to the **triangle CDE**. Part of the consumer surplus under competition is redistributed in favour of the monopolist – its residual profit is equal to the rectangle p^mCDp^c. While a monopoly normally overcharges consumers there could also be a different problem if there is one large dominant firm facing potential market entry: Dumping or predatory pricing, aimed at fencing off market entry, would be the case that the dominant firm charges prices below costs.

Fig. 3: Competition Versus Monopoly (with constant marginal costs k')



In telecommunications there are therefore, two potential challenges, namely overcharging and dumping. The regulator can assess these problems only if it has some basic knowledge about cost structures so that an adequate analytical background is necessary for the regulator.

Potential problems associated with the existence of a dominant position concern:

- Refusal to deal: this is related to the essential facilities doctrine: an essential facility is a facility supplied on a monopoly basis which is required by competitors and cannot be reasonably duplicated by competitors for economic or technical reasons. This problem of a monopolistic bottleneck often, is crucial.
- Predatory pricing: the (dominant) operator charges prices below a normal cost standard, and there is evidence that this is not sporadic or reactive price-cutting. This strategy aims to keep newcomers at bay.
- Cross subsidization: the dominant firm uses revenues from a market in which it is dominant to cross-subsidize the price of a service or product it provides in other

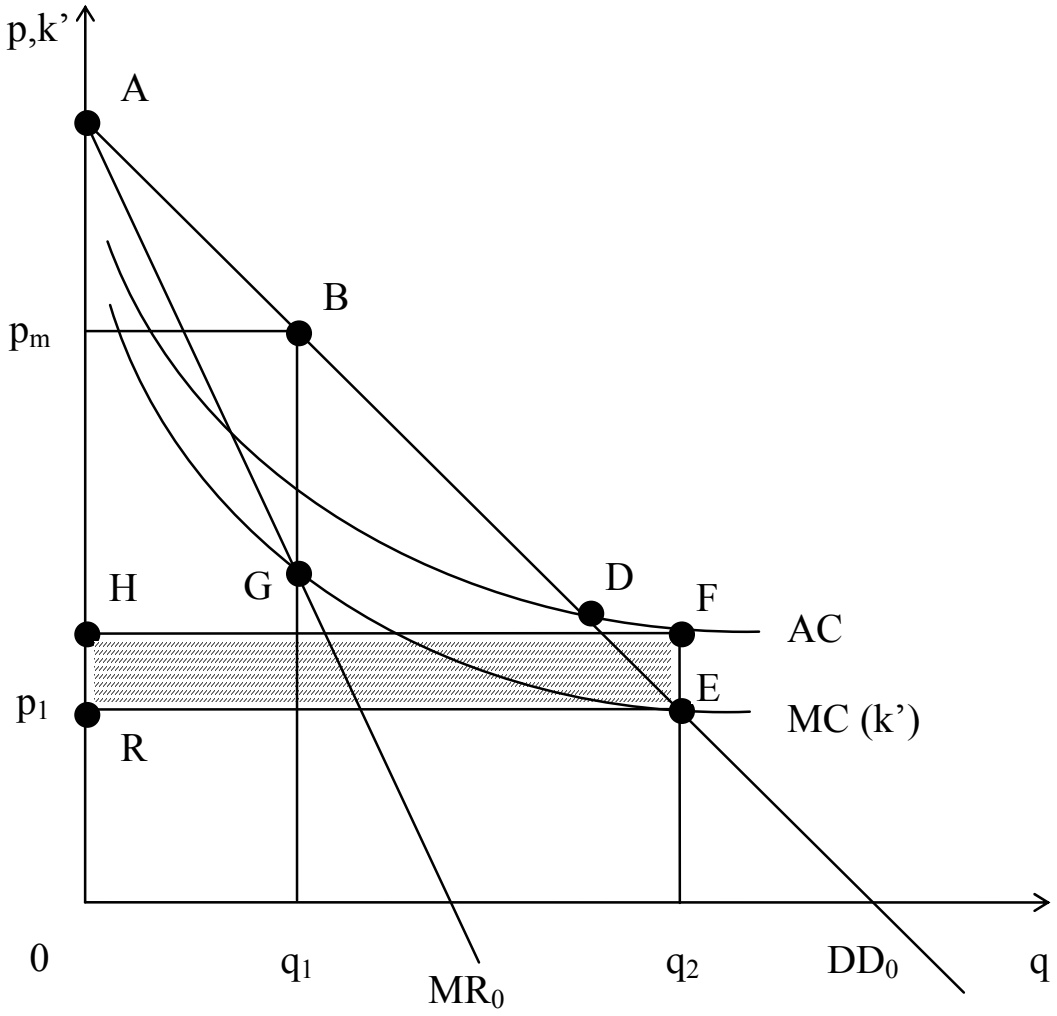
markets – thus impairing competitors and keeping out newcomers; in some case the threat of predatory pricing will suffice to keep newcomers out of the market.

- Tied sales/bundling: Service 1 sold only if service 2, 3,...n are also bought – this is anti-competitive if firm has a dominant position in one of these markets. The dominant position is thus effectively transferred to other markets.
- Excessive pricing: the price is above the level under competition so that there is a monopolistic element in pricing.

As many former monopoly operators enjoy a market share above 50 percent in fixed line telecommunications the potential problems associated with dominance have to be studied carefully by the regulator.

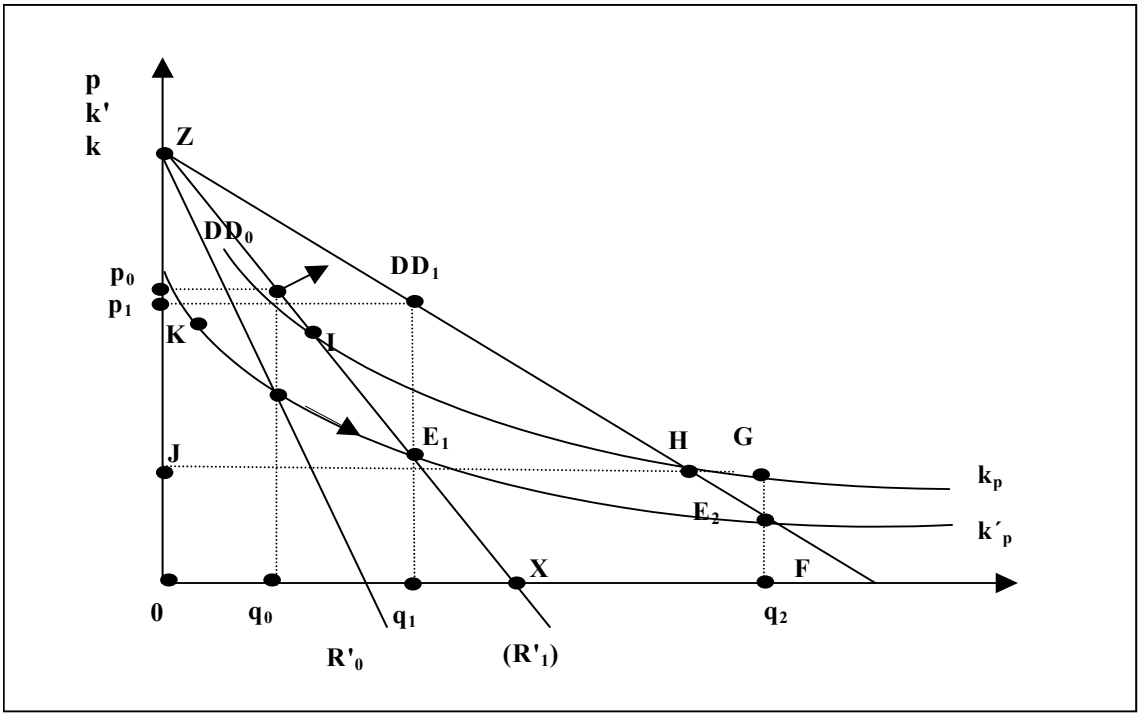
The problem of market dominance in telecommunications is serious to the extent that there is a natural monopoly in fixed-line telecommunications. Indeed, there are economies of scale and economies of density in part of the fixed-line network operation which imply falling average costs (AC) and falling marginal costs k' (or MC). From an economic perspective it would be optimal to realize point E that output where marginal cost is equal to marginal benefit. However, this will require a subsidy since average costs exceed marginal costs by the distance EF. The overall subsidy would be equal to the area FEp_0H. One of the many problems associated with subsidization is that other industries will also call for subsidization. Moreover, every subsidy has welfare costs through the necessary financing and raising of taxes, respectively. Fixing output in accordance with the intersection of the average costs curve and the demand curve would be a second-best optimum which indeed, might come very close to an optimum – subsidization is avoided. If part of telecommunications is a natural monopoly – the access market could indeed, stand for such a situation in many countries – it is clear that there will be the problem of a dominant operator or even a monopoly. Regulatory interference is necessary in this case.

Fig. 4: Natural Monopoly/Economies of scale



Telecommunications is more complex than other industries not least due to the existence of network effects: The existing early users of a certain service will enjoy higher benefits if other consumers/firms are also linked to the network and also use the respective service. Such network effects imply an endogenous growth of sectoral demand (for an economist this looks similar – but only similar! - to the case of positive external effects on the demand side; in such a case the social benefits exceed private benefits so that the relevant demand curve is farther to the right than individual willingness to pay indicates). It is unclear whether telecommunication firms can fully anticipate network effects; correct anticipation would be crucial for adequate investment planning. Assuming that network effects show up as an outward rotation of the demand curve we can portray an initial demand curve DD_0 (without network effects) and the dynamic demand curve DD_1 which includes network effects.

Fig. 5: Network Effects and Natural Monopoly



The demand curve DD_1 is drawn in such a way that the initial demand curve DD_0 coincides with the marginal revenue curve (R'_1) for DD_1. We can immediately see there is a large discrepancy between monopoly pricing on the basis of DD_0 and the optimum solution in point F or the second-best solution in point H. The existence of network effects implies that it is useful to have several suppliers, ideally in an oligopolistic setting with considerable interdependence among firms. For example**,** with several firms active in the mobile telecommunications market the spreading of new services has been very fast since each major operator wants to be a leader in product innovations while making sure that novel services can also be transmitted to other mobile operators, or to fixed-line network users.

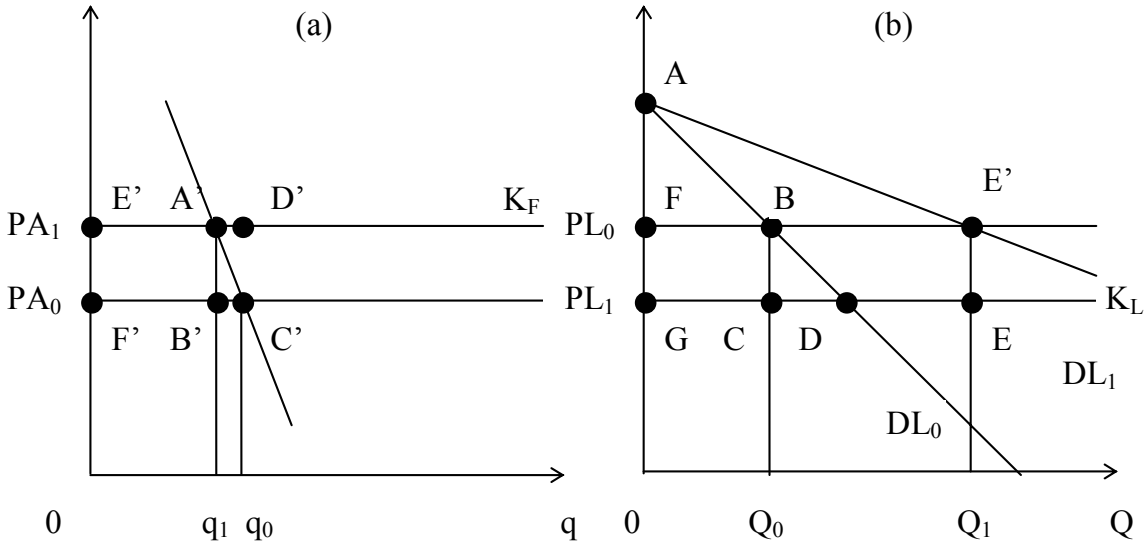
Network effects are also crucial when it comes to process innovation. Take the simple case of constant marginal costs, process innovations imply a downward shift of the k' curve. With network effects there is an additional increase in consumer welfare. Therefore, it is crucial that the regulatory framework stimulates process innovations.

Another problem related to the telecommunications market and market power, respectively, concerns the interdependence between the access market and services markets – e.g., the long distance market. Typically, the demand curve in the access market is rather steep. The long distance market is relatively price elastic, and it is characterized by network effects so that DL_1 is the relevant demand curve; not DL_0 which is the static short term demand curve (without network effects). In the presence of network effects in the services market it pays off for an integrated network operator to subsidize access and hence, to charge only PA_0 while average fixed costs is K_F. Cross subsidization can be realized if firms can charge PL_0 in the long distance market which is higher than average costs in the long distance market (K_L). Without network effects the quantity in equilibrium (in line with the simple original demand curve DL_0) would be Q_0, but due to network effects (see DL_1) – partly mobilized through subsidization of access – it will be Q_1. One may note here that the principle of cross-subsidization in combination with network effects can be applied to many topics; for

example, membership in international organizations where access could be offered at an effective discount price in order to generate the more important benefits of enlarged network effects with a higher number of "club members" – an offsetting effect is, of course, related to rising marginal costs of consensus building in a club with a growing membership base.

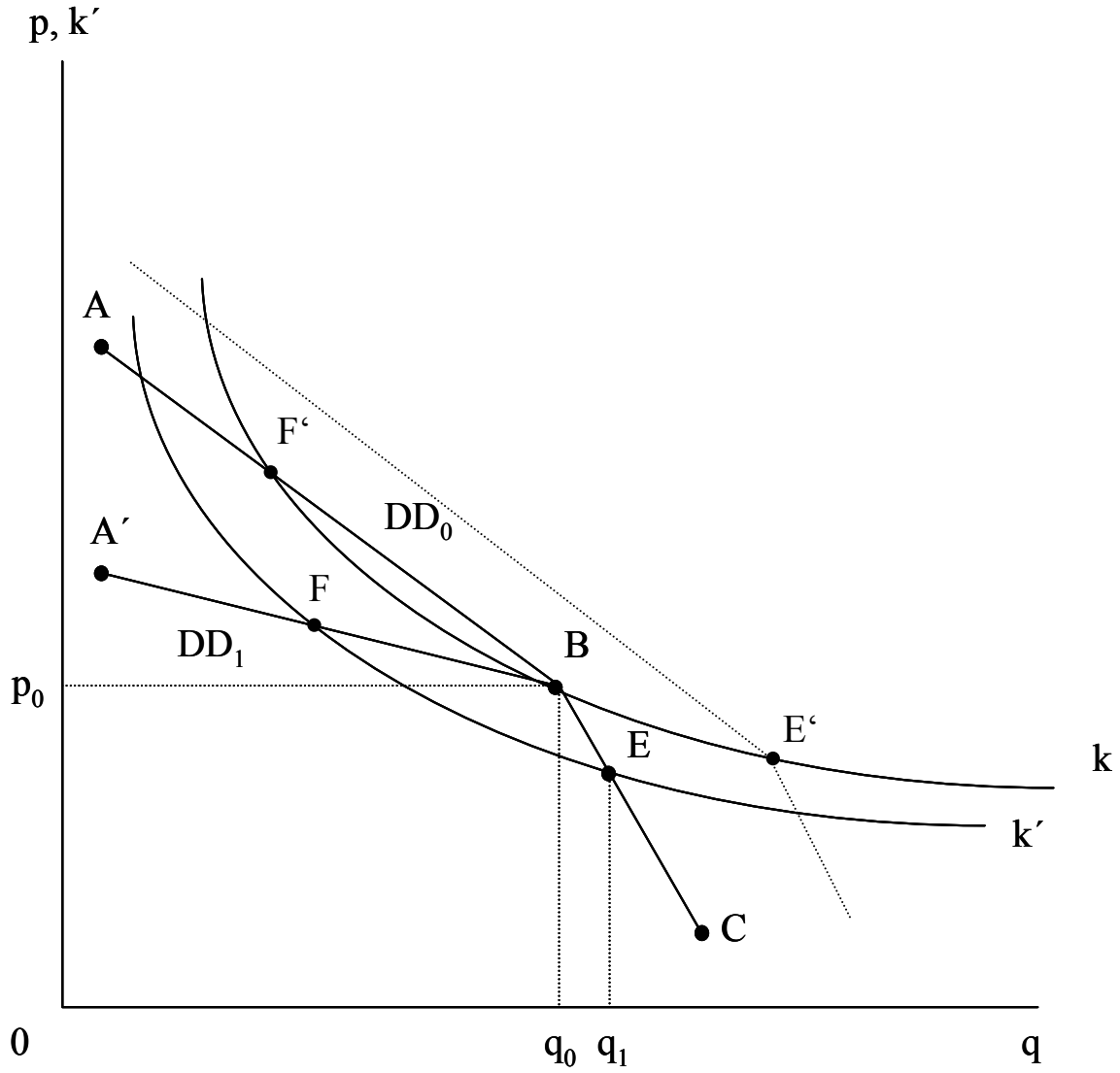
While subsidizing access generates only a small increase in the customer base the associated network effects could be considerable; and in any case the economically more important aspect here. Anticipation of network effects in the digital services market will be rather easy for an integrated telecommunications firm. If one would dismember a telecommunications operator in the sense that it would be split into a pure network operator and a pure service provider, anticipation of network effects would be more difficult. This could be a rather strong argument not to pursue vertical disintegration in telecommunications (this argument does, however, not hold for the electricity sector which also provides services based on networks, but there are no network effects on the demand side).

Fig. 6: Access Market and Long Distance Market



There is an asymmetrical interdependency under oligopoly: if there is price reduction of supplier 1 the other firms will follow which makes the effective demand curve less price elastic (steeper than a normal demand curve). If firm 1 raises the price other firms will, by assumption, not follow so that the effective demand curve is more elastic above point B: see the segment BA'. If the oligopoly is widening in asymmetric way – with firm 1 establishing itself as a clear "leading leader" – that is more firms could follow the pricing strategy of the leader (firm 1) so that the demand curve becomes steeper above point B: see segment BA; temporary pricing according to marginal costs implies a reduced quantity in this situation with a more pronounced price leadership (compare point F' and F), If the situation is a stable oligopoly with no clear leadership there is not a big difference between the hypothetical optimum defined by equality of marginal costs and the demand curve and pricing based on average costs (point B and equilibrium quantity q_0 versus optimum output q_1 and point E, respectively). The problem of a dominant market position – and hence, the situation of a leading leader - is likely to emerge in an oligopoly in which one firm has a clear lead in the market share. The existence of network effects would not really alter the argumentation, only the equilibrium point is moving from E to E'.

Fig. 7: Modified Hitch-Sweezy Approach to Oligopoly



In the case of dynamic limit pricing we have a situation in which one dominant operator acts as an undisputed leader and is fixing the price in a way that it minimizes the incentive for newcomers to enter the market. A simple approach (see the model in the appendix) shows that under certain conditions the price is lowered by ½ of the quantity offered by newcomers. Thus, we can conclude that newcomers help to reduce the price charged by the industry leader to a level below the monopoly price, but at the same time we can see that the equilibrium price is clearly above the price under competition.

2.1.2. Market Entry, Substitution Aspects, Bundling and Innovation

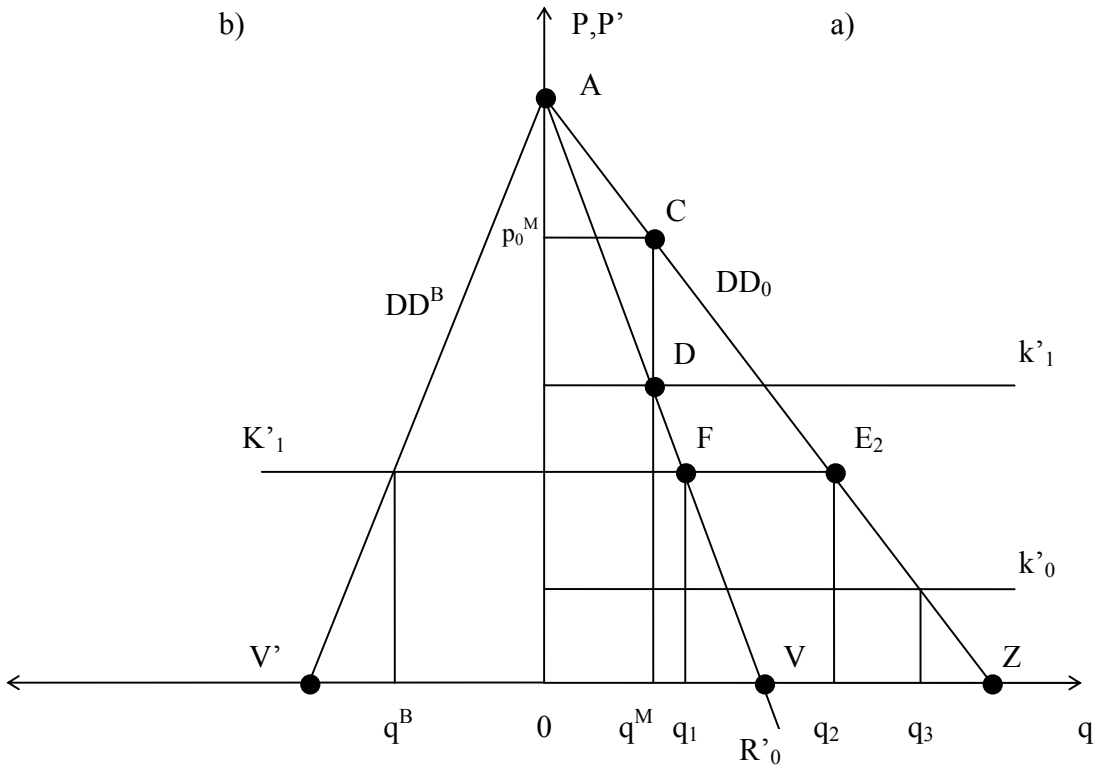
Market entry in telecommunications is limited to the extent that there are high sunk costs. From this perspective, rising marketing expenditures in telecommunications markets are an impediment for newcomers. However, it seems that after economic opening up of the telecommunications markets in the EU in 1998 network operators have reduced expenditures on research and development (R&D) while equipment producers have raised the share of R&D expenditures. Such a development suggests that the markets for telecommunications network operation and digital services, respectively, have indeed, become more open. There can also be political impediments to market entry. Such impediments are more likely, the

higher the share of government in the incumbent telecommunications operator is. So, it would adequate that government fully privatizes the telecommunications sector.

Assume that we have initially only one firm which acts as a monopoly and because of this, charges price p_0^M (see part a) of the following graph). If a second firm, B, with relatively low marginal costs K'_1 - see part b) in the following graph – considers entering the market one may assume that both firms will attract half of the initial demand DDo (DD_B is half of DDo). If the incumbent for whom all costs are non-sunk prior to entering the market, indeed would enter the market it might force the incumbent firm to adopt a price equal to K'_1 so that q_1 is output for the incumbent firm and q_B for firm B. The problem for the incumbent is that in such a setting it would suffer losses as the firm could not recover marginal costs fully. In this, there is a strong incentive to discourage market entry.

If the incumbent has marginal costs k'_1 there is an incentive to pursue limit pricing in the sense that the incumbent will lower the price below k'_1 in order to fend off market entry; by how much the incumbent will transitorily lower the price normally depends on the size of sunk costs: The reason for this is it is rational for the incumbent to lower prices at the maximum down to this level. So if we assume that k'o is sunk marginal costs the incumbent might be able to effectively discourage market entry (in Germany in 2002/03 a typical case was when the incumbent fixed-line network operator decided to suddenly reduce DSL prices enormously, which more or less killed market entry prospects for cable TV firms to enter broadband digital services markets outside the narrow market of TV broadcasting).

Fig. 8:.Problem of Sunk Cost, Limit-Pricing and Long-run Equilibrium



Market entry also is impaired if there is a tendency toward unnatural bundling of products or services. Competition authorities will not consider normal bundling – as it emerges under competitive conditions – as a problem. However, if the dominant operator, the former

monopoly firm, is the driving force behind bundling (and indeed sets the standard for bundling) it is quite unclear whether there is normal bundling. A major motive for the incumbent to embark upon bundling is the desire to transfer market power from one market i – where it enjoys a dominant position - to another market j, in which it does not enjoy a dominant role. Bundling, thus can help to reinforce market power across markets in a simple way; indeed, it also supports market power by raising barriers to entry. Newcomers willing to enter the market cannot simply enter a narrow market niche but are required to offer a broad range of services, which is rather risky and costly.

Market power is a relative concept. From a demand-side perspective, market power is lower the more substitutes are available in other markets. For example, if broadband DSL fixed-line access is not available at reasonable conditions cable TV could be a welcome and cheap alternative; or UMTS mobile services (to date mobile telecommunications often is considered to be complementary to fixed-line telecommunications, however, among the young generation and in many newly industrialized countries, this perception seems to be rather doubtful). Countries which have cable TV systems thus would be wise to encourage users to also use that system for telecommunications, Internet services and other digital services.

3. Practical Aspects

As long as there is a clearly dominant operator there is a need for some basic ex ante regulation. If the market share declines and if there are clear signs for sustained competition one may phase out ex ante regulation gradually. A serious problem in most countries is bundling since it is rather common on the one hand, on the other hand it is difficult to prove that the type of bundling realized could not have emerged in competitive markets. From this perspective the few very competitive markets – such as Finland (with three competing long distance companies) or the Netherlands or the UK (the latter two with a strong role of cable TV in telecommunications services) are quite important. Germany has also been rather successful in opening up telecommunications markets. However, government's artificial splitting of transmission layers in cable TV in the late 1980s has undermined the ability of cable TV firms to upgrade the network for modern digital services, including Internet; moreover, the competition authority ("Federal Cartel Office") has imposed very high barriers for mergers in the cable TV system, which implies that there will be hardly any investment in cable TV and in this, a broadband gap in Germany in the long run.

Mobile telecommunications has problems of its own. It is not easy to adequately regulate mobile termination fees. The Ramsey Rule calls for charging fixed costs on those services whose price elasticity is rather low – following this rule makes sure that welfare losses from regulation are low (raising the price of a good with a low price elasticity will bring about a minor change in the equilibrium quantity!). While a simple cost-oriented pricing approach would suggest that mobile termination fees should be rather similar across OECD countries, Ramsey-pricing suggests that there could be considerable price differentials across countries, provided that the elasticities of demand differ considerably.

If there is a dominant market position regulatory authorities normally would try to avoid the abuse of dominant market power in the relevant market. Market power can be measured in various ways:

- Market power= for example, measured as market share
- Market power= for example, measured by import competition
- Market power= for example, measured through barriers to entry: such barriers are mainly sunk costs – those costs which cannot be recovered after going out of business, namely costs for research and development plus costs for marketing.
- Market power = for example, as emerging through the absence of countervailing power on the demand side.

Merger control (national and supranational) is often concerned with problem of significant market power. Therefore, it is useful to take a closer look at what in court cases, have been defined as a problem in the context of planned mergers. Almost all countries will consider it natural that monopolization should be prohibited since a monopoly will bring economic inefficiencies; and due to the economic market power, there could also be political power emerging – plus unproductive rent-seeking.

Regulatory policy in EU member countries is rather straightforward: it encourages newcomers by limiting market power of the incumbent operator which could deny interconnection, impose price discrimination, pursue discriminatory pricing, threat predatory pricing and so forth. For regulatory authority, impartial regulation is rather difficult if government still has a major stake in the incumbent operator. Government might put pressure on the regulator to adopt regulations that guarantee high prices and consequently, high profits for the incumbent operator. Such a behavior is nice only in the short run for the Minister of Finance which will benefit from high dividend payouts by the incumbent operator. However, the more important long term aspect is cheaper innovative services – realized in a more competitive framework – would stimulate overall economic growth and typically generate additional tax revenues than a protective strategy in favour of the partially state-owned incumbent.

Determining the relevant market in an environment with digital convergence is also rather cumbersome. The easiest way to determine the relevant market is to consider substitution on the demand side: if the cross price elasticity should be very high – a rise of the price in the i-market generates thus an enormous increase in the j-market – it is clear that both markets considered are effectively one market. Here, empirical studies are needed. One cannot rule out that over time mobile telecommunications will become a very strong substitute to fixed-line telecommunications. This is rather likely for young users and for countries catching-up economically (for example, EU eastern European accession countries). Market demarcations and market shares will look, of course, different if fixed-line and mobile market would have to be considered as a joint market. This will be an interesting issue in the future.

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Appendix: Dynamic Limit Pricing – A New Model

Fixed line telecommunications was a state monopoly in EU countries until 1998, except for the UK, where it had already been liberalized in 1984 within the context of a transitory duopoly approach. After market liberalization the former monopoly operator – in many countries partly or fully privatised within a few years – faced emerging competition from newcomers. Despite asymmetric regulation which imposed price regulation within an RPI-x-approach – based on baskets of telecommunications services – the market share of newcomers remained low over many years (except for Finland). The situation of one dominant operator facing many newcomers which accept price leadership of the large company can easily be analyzed in terms of price dynamic limit pricing. Such an approach is not only useful with respect to economic opening up of markets in telecommunications but also is interesting with respect to the OPEC cartel where we assume that Saudi Arabia plays the role of an accepted leader in global oil markets; alternatively one may consider the OPEC as a dominant quasi actor which sets the price for all suppliers.

In the following analysis we will use the standard approach to dynamic limit pricing of GASKINS (1971), refine it – by assuming that the growth rate of output of newcomers is reacting to the price of the incumbent - and apply it to fixed line telecommunications. We will also develop a convenient graphical presentation.

Assuming profit maximizing behaviour in the core business of voice telephony of the incumbent operator in fixed line telecommunications is sensible to the extent that the definition of the basket is relatively broad. Demand in industry at time t is represented by a linear demand schedule:

(1) $q(t) = a - bp(t)$

(2) $P = A - Bq$; where $a/b = A;\ 1/b = B$

The incumbent operator sets the price and a fringe of small firms accepts this price (in a refined model: takes this price minus Z which represents the marginal cost advantage of newcomers) and sells their entire output. x(t) is the output of the newcomer firms where fringe firms enter the market if the dominant operator charges a price greater than p^0. The initial x(0) in t=0 is given. Hence,

(3) $dx/dt = v\left(p(t) - p^0\right)x$

The incumbent operator has sales volume of q(t) – x(t), marginal costs k'=c, that are constant. Thus, the discounted present value of its profits are

(4) $\int_0^\infty \left(p(t) - c\right)\left[a - x(t) - bp(t)\right]e^{'-\varphi t}\,dt$

The Hamiltonian for this problem is – with π denoting the shadow price:

(5) $H = \left(p(t) - c\right)\left[a - x(t) - bp(t)\right]e^{'-\varphi t} + \pi v\left(p(t) - p^0\right)x$

The optimum price is given by setting ∂H/∂p =0 and hence

(6) $0 = \left[(a - x) - 2bp + bc\right]e^{'-\varphi t} + \pi v x$

which results in the optimum leader price p^L:

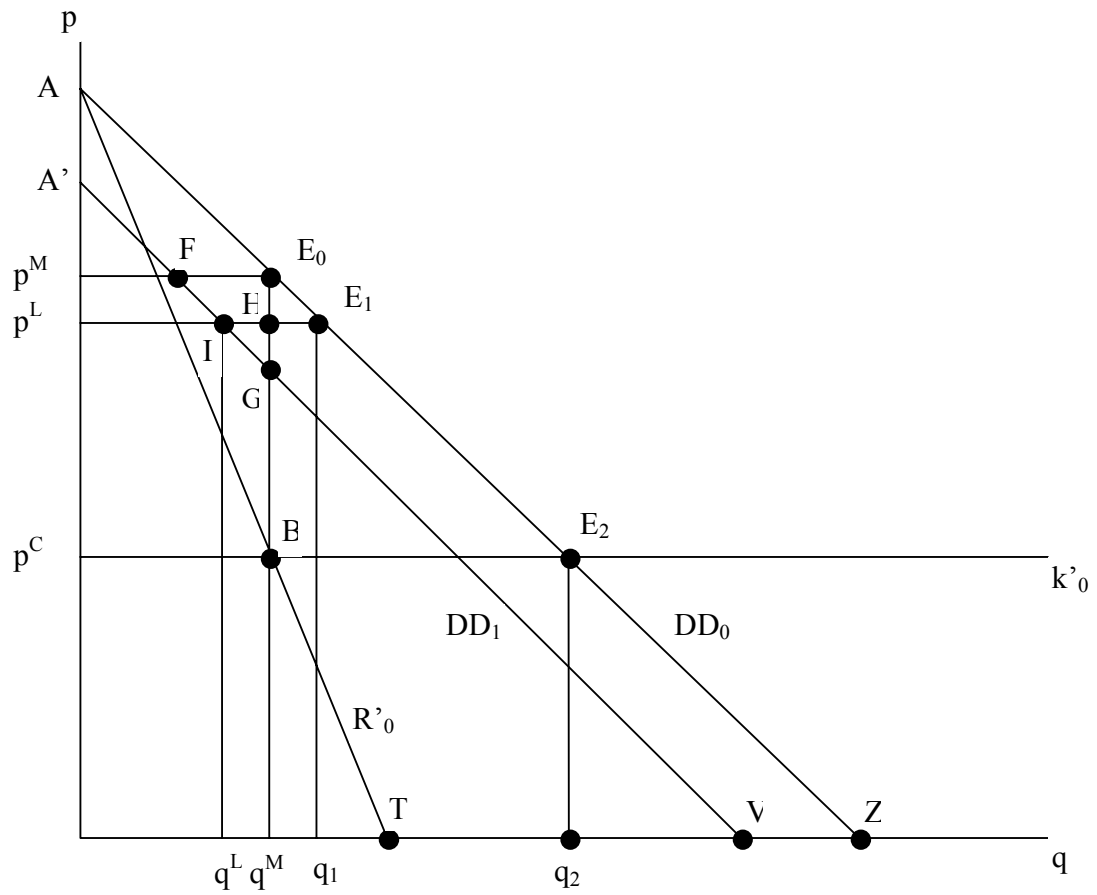
(7) $p^L = \left[(a - x)/(2b)\right] + (c/2) + \pi\left(v/(2b)\right)xe^{'\varphi t}$

With t approaching 0 we get an interesting result for the initial period if x(0) is zero, that is we take a look at an incipient market opening up:

(8) $p_L = \left[(a-x)/(2b)\right] + (c/2)$

Compared to the monopoly price - Cournot solution p= [a/(2b)] +(c/2)] - this price is smaller by the amount of x/(2b): We can easily show a graphical solution for the special case of b=1 for the initial period, namely t approaching zero: Taking the monopoly price as a point of reference the market price under full leadership is reduced by ½ of the output of newcomers. Hence, the price is lower than in a monopoly but it also will be higher than under full competition (p=c).

Fig. 9: Competition vs. Monopoly vs. Leadership Model: Dynamic Limit Pricing (case of constant marginal costs)



Applying the maximum principle we get the following differential equations:

(9) $dx/dt = \partial H/\partial \pi = \nu\left(p(t) - p^0\right)x$

(10) $dp/dt = \partial H/\partial x = \left[p(t) - c\right]e^{'\varphi t} - \pi\nu$

Equations (9) and (10) are differential equations for x and p so that we can determine the steady state values for x and p. In p-x space we get from setting (9)=0 that, of course, output of fringe firms rises when p(t) exceeds p^o. From (10) we get for dp/dt=0 the expression $\pi\nu = [p(t)-c]e^{'-\varphi t}$ so that we can substitute $\pi\nu$ in expression (7) and obtain for the steady state value of p#:

(7.1) $p^{L\#} = [(a-x)/(2b)] + (c/2) + ([p(t)-c]/(2b))x$

(7.2) $p^{L\#} = \{[a-x] + (cb) - cx\}/[2b-x]$

Hence, the explicit solution for the steady state is the following leader price:

For the case of b=0.5 we can derive an approximation, namely:

(7.3) $\ln p^{L\#} = \ln\{[(a-x)] + (cb) - cx\} + x$

Comparing (7.3) with (8) we can see that the steady state solution is higher than the early market-opening price. Since the leader price increases over time until the equilibrium value has been reached we know that the fringe output will increase provided that p(t) initially was not lower than p^0.

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